

Wed, Jun 11, 2008

Possible LARP PS2 Packages

DRAFT!

UW, Thu, Jun 12, 2008

PS2 Package 1: Tracking, nonlinearities, space charge, halos, H^- injection

This package covers R&D work associated with injection, space-charge and lattice acceptance. The challenge here lies in the high beam current aimed for in PS2: H^- injection will be tricky (and at an unprecedented 4 GeV injection energy); beam collimation will likely be required to work at high efficiency & could potentially benefit from the LARP involvement in the crystal collimation collaboration (CERN-FNAL-SLAC & others), thus having natural synergy with the Project-X work at FNAL in injection simulation and beam collimation while going beyond what has been done so far. Laser stripping is being actively investigated by SNS and would be extremely beneficial for both PS2 as well as FNAL Project X as well as SNS. The work done at BNL and other labs on the design & evaluation of imaginary-transition lattices will find its natural continuation here as imaginary transition is now the primary considered option for PS2.

PS2 Package 2: Intensity effects, Instabilities

This package covers R&D work on intensity and impedance-related effects incl. e-cloud. SLAC and LBL have a history of successful collaboration in this area, exemplified by PEP-II and the e-cloud work. The proposed package builds on the strengths of these labs in e.g. evaluating vacuum-system components both numerically as well as experimentally while at the same time extending this work into new regimes of frequency. Bunch-by-bunch feedback systems (if needed) are potentially challenging for PS2 due to tight requirements on induced noise to prevent emittance growth; these may require novel techniques to be developed for the electronics as well as for low-impedance kickers. The e-cloud work would extend the LARP collaboration with SPS already in place and will potentially feed into concepts for vacuum chambers with low secondary emission. Besides SLAC and LBNL, there will be synergy with FNAL Project X work and also e-cloud work ongoing at BNL-RHIC.

PS2 Package 3: Rf System

This package covers R&D work on 40-MHz perpendicularly-biased ferrite-tuned rf cavities. With PS2 studies for the time being focusing on an imaginary-transition lattice, 40-MHz rf is the obvious frequency choice. While the FNAL-Booster-type cavity design could possibly be adapted to the frequency range needed for the PS2, the desire is to complete the development of the perpendicularly biased cavity originated at LANL, which allows for 2...3 times the rf voltage/cavity. This will be a technologically challenging project to work on, and should be again of interest to FNAL. The LLRF would extend on the work done on highly beam-loaded rf systems—mainly at SLAC—while adding the challenge of variable rf frequency and the different frequency range (areas of experience at FNAL and BNL).